WE CLAIM:

1. An extrusion die for use in an apparatus to produce multi-layered pipes, the extrusion die comprising:

(a) a first and second die assembly, each die assembly comprising:

(i) an extrusion head having a central bore and a lateral opening for receiving an extrudate;

(ii) a nozzle, operably connected to the extrusion head, the nozzle having an outer die lip at a free end of the nozzle;

(iii) a hollow mandrel coaxially located in the central bore,

(iv) an inner mandrel coaxially located in the hollow mandrel and in the nozzle, the inner mandrel having an inner die lip at a free end of the inner mandrel; the inner die lip and outer die lip defining a die gap; and

(v) the nozzle and inner mandrel defining a layer-forming channel in fluid communication with the lateral opening and the die gap;

wherein a central portion of the nozzle of the second die assembly is co-axially located within the inner mandrel of the first die assembly such that the nozzle of the second die assembly and the inner mandrel of the first die assembly define an air space.

2. The extrusion die of claim 1, wherein the air space allows the extrudate in the layer-forming channel of the first die assembly to be at a temperature different than the extrudate in the layer-forming channel of the second die assembly.

3. The extrusion die of claim 1, further comprising means for moving the second die assembly longitudinally within the inner mandrel of the first die assembly, thereby altering a longitudinal distance between the die gap of the first die assembly and the die gap of the second die assembly.

4. The extrusion die of claim 1, further comprising means near the extrusion head for moving the inner die lip longitudinally, thereby altering the size of the die gap.

5. The extrusion die of claim 1, further comprising a spacer located in the air space.

6. The extrusion die of claim 5, wherein the spacer comprises openings through which air can be introduced.

7. The extrusion die of claim 1, further comprising a spiral disposed in a location downstream of the first and second die assembly.

8. The extrusion die of claim 1, wherein the extrusion head, nozzle, outer die lip and inner die lip of each of said first and second die assemblies include electrical heaters and thermal sensors.

9. The extrusion die of claim 1, further comprising a third die assembly as defined in (a), wherein a central portion of the nozzle of the third die assembly is co-axially located within the inner mandrel of the second die assembly, such that the nozzle of the third die assembly and the inner mandrel of the second die assembly define a second air space.

10. The extrusion die of claim 1, further comprising a vacuum cooling mandrel disposed in a location downstream from said first and second die assemblies, said vacuum cooling mandrel comprising a single cooling channel and multiple vacuum ports, said multiple vacuum ports disposed along an outer surface of the cooling mandrel.

11. The extrusion die of claim 10, wherein a vacuum is introduced through said vacuum ports.

12. The extrusion die of claim 3, wherein the air space allows the extrudate in the layer-forming channel of the first die assembly to be at a temperature different than the extrudate in the layer-forming channel of the second die assembly.

13. The extrusion die of claim 3, further comprising means near the extrusion head for moving the inner die lip longitudinally, thereby altering the size of the die gap.

14. The extrusion die of claim 3, further comprising a spacer located in the air space.

15. The extrusion die of claim 14, wherein the spacer comprises openings through which air can be introduced.

16. The extrusion die of claim 3, further comprising a spiral disposed in a location downstream of the first and second die assembly.

17. The extrusion die of claim 3, wherein the extrusion head, nozzle, outer die lip and inner die lip of each of said first and second die assemblies include electrical heaters and thermal sensors.

18. The extrusion die of claim 3, further comprising a third die assembly as defined in (a), wherein a central portion of the nozzle of the third die assembly is co-axially located within the inner mandrel of the second die assembly, such that the nozzle of the third die assembly and the inner mandrel of the second die assembly define a second air space.

19. The extrusion die of claim 3, further comprising a vacuum cooling mandrel disposed in a location downstream from said first and second die assemblies, said vacuum cooling mandrel comprising a single cooling channel and multiple vacuum ports, said multiple vacuum ports disposed along an outer surface of the cooling mandrel.

20. The extrusion die of claim 19, wherein a vacuum is introduced through said vacuum ports.

21. The extrusion die of claim 4, wherein the air space allows the extrudate in the layer-forming channel of the first die assembly to be at a temperature different than the extrudate in the layer-forming channel of the second die assembly.

22. The extrusion die of claim 4, further comprising a spacer located in the air space.

23. The extrusion die of claim 22, wherein the spacer comprises openings through which air can be introduced.

24. The extrusion die of claim 4, further comprising a spiral disposed in a location downstream of the first and second die assembly.

25. The extrusion of claim 4, wherein the extrusion head, nozzle, outer die lip and inner die lip of each of said first and second die assembly include electrical heaters and thermal sensors.

26. The extrusion die of claim 4, further comprising a third die assembly as defined in (a), wherein a central portion of the nozzle of the third die assembly is co-axially located within the inner mandrel of the second die assembly, such that the nozzle of the third die assembly and the inner mandrel of the second die assembly define a second air space.

27. The extrusion die of claim 4, further comprising a vacuum cooling mandrel disposed in a location downstream from said first and second die assemblies, said vacuum cooling mandrel comprising a single cooling channel and multiple vacuum ports, said multiple vacuum ports disposed along an outer surface of the cooling mandrel.

28. The extrusion die of claim 27, wherein a vacuum is introduced through said vacuum ports.

29. An extrusion die for use in an apparatus to produce multi-layered pipes, the extrusion die comprising:

(a) a first and second die assembly, each die assembly comprising:

(i) an extrusion head having a central bore and a lateral opening for receiving an extrudate;

(ii) a nozzle operably connected to the extrusion head, the nozzle having an outer die lip at a free end of the nozzle;

(iii) a hollow mandrel coaxially located in the central bore,

(iv) an inner mandrel coaxially located in the hollow mandrel and in the nozzle, the inner mandrel having an inner die lip at a free end of the inner mandrel; the inner and outer die lips defining a die gap; and

(v) the nozzle and inner mandrel defining a layer-forming channel in fluid communication with the lateral opening and the die gap;

wherein a central portion of the nozzle of the second die assembly is co-axially located within the inner mandrel of the first die assembly.

30. The extrusion die of claim 29, wherein the extrudate in the layer-forming channel of the first die assembly is at a temperature different than the extrudate in the layer-forming channel of the second die assembly.

31. The extrusion die of claim 29, further comprising means near the extrusion head for moving the inner die lip longitudinally, thereby altering the size of the die gap.

32. The extrusion die of claim 29, further comprising a spiral disposed in a direction downstream of the first and second die assembly.

33. The extrusion die of claim 29, wherein the extrusion head, nozzle, outer die lip and inner die lip of each of said first and second die assembly include electrical heaters and thermal sensors.

34. The extrusion die of claim 29, further comprising a third die assembly as defined in (a), wherein a central portion of the nozzle of the third die assembly is co-axially located within the inner mandrel of the second die assembly.

35. The extrusion die of claim 29, further comprising a vacuum cooling mandrel disposed downstream from said first and second die assemblies, said vacuum cooling mandrel comprising a single cooling channel and multiple vacuum ports, said multiple vacuum ports disposed along an outer surface of the cooling mandrel.

36. The extrusion die of claim 30, wherein a vacuum is introduced through said vacuum ports.

37. A vacuum cooling mandrel for an extrusion die, said vacuum cooling mandrel comprising a single cooling channel and multiple vacuum ports, said multiple vacuum ports disposed along an outer surface of the cooling mandrel.

38. The vacuum cooling mandrel of claim 37, wherein a vacuum is introduced through said vacuum ports.

39. A method for preparing a multi-layered pipe using the extrusion die of claim 1, wherein said method includes the steps of:

(a) introducing under pressure a first extrudate into the lateral opening of the first die assembly and introducing a second extrudate into the lateral opening of the second die assembly;

(b) passing said first and second extrudates through said first and second layer-forming channels; and,

(c) receiving said first extrudate from the die gap of the first die assembly and receiving the second extrudate from the die gap of the second die assembly.

40. The method of claim 39, wherein the first extrudate has a different temperature profile than the second extrudate.

41. The method of claim 39, further comprising the step of adjusting the longitudinal distance between the die gap of the first die assembly and the die gap of the second die assembly by moving the second die assembly longitudinally within the inner mandrel of the first die assembly.

42. The method of claim 39, further comprising the step of introducing air pressure into the air space.

43. The method of claim 39, wherein the extrusion die further comprises means near the extrusion head for moving the inner die lip longitudinally, said method comprising the additional step of altering the size of the die gap by using said means.

44. The method of claim 39, wherein the extrusion die further comprises a vacuum cooling mandrel disposed in a location downstream from said first and second die assemblies, said vacuum cooling mandrel comprising a single cooling channel and multiple vacuum ports, said multiple vacuum ports disposed along an outer surface of the cooling mandrel.

45. The method of claim 44, further comprising the step of shaping the second extrudate using the vacuum cooling mandrel.

46. The method of claim 45, further comprising the step of introducing a vacuum through said vacuum ports.

47. A method for preparing a multi-layered pipe using the extrusion die of claim 30, wherein said method includes the steps of:

(a) introducing under pressure a first extrudate into the lateral opening of the first die assembly and introducing a second extrudate into the lateral opening of the second die assembly;

(b) passing said first and second extrudates through said first and second layer-forming channels; and,

(c) receiving said first extrudate from the die gap of the first die assembly and receiving the second extrudate from the die gap of the second die assembly.

48. The method of claim 47, wherein the first extrudate has a different temperature profile than the second extrudate.

49. The method of claim 47, further comprising the step of adjusting the longitudinal distance between the die gap of the first die assembly and the die gap of the second die assembly by moving the second die assembly longitudinally within the inner mandrel of the first die assembly.

50. The method of claim 47, wherein the extrusion die further comprises means near the extrusion head for moving the inner die lip longitudinally, said method comprising the additional step of altering the size of the die gap by using said means.

51. The method of claim 47, wherein the extrusion die further comprises a vacuum cooling mandrel disposed in a location downstream from said first and second die assemblies, said vacuum cooling mandrel comprising a single cooling channel and multiple vacuum ports, said multiple vacuum ports disposed along an outer surface of the cooling mandrel.

52. The method of claim 51, further comprising the step of shaping the second extrudate using the vacuum cooling mandrel.

53. The method of claim 52, further comprising the step of introducing a vacuum through said vacuum ports.

54. A method for shaping a multi-layered pipe using the vacuum cooling mandrel of claim 37, comprising the step of introducing a vacuum through said vacuum ports